REMARKS/ARGUMENTS

The Official Action mailed February 28, 2005 has been carefully considered. Reconsideration and allowance of the subject application, as amended, are respectfully requested.

The Examiner rejected claims 1 – 14 under 35 USC 103(a) as being unpatentable over Kitagawa (US Pat. No. 6,204,633) in view of Tamai (US Pat. No. 5,442,274). Applicants respectfully traverse this rejection. Regarding claim 1, the Examiner argued that Kitagawa discloses a first path to monitor a first battery charging current provided to a first battery (Element 15x) and a second path to monitor a second battery charging current level provided to a second battery (Element 15y). The Examiner further indicated that "Kitagawa does not expressly discloses a regulating circuit configured to reduce said system charging parameter provided to said host of batteries if said first charging current exceeds a first predetermined maximum charging current level or said second charging current exceeds a second predetermined maximum charging current level." Rather, the Examiner relies on Tamai to teach "a regulating circuit configured to reduce said system charging parameter provided to said host of batteries if said first charging current exceeds a first predetermined maximum charging current level."

Regarding claim 3, the Examiner argued that Kitagawa discloses a third path configured to monitor a first battery charging voltage level (Figure 3, Elements 11 and 12x) and a fourth path configured to monitor a second battery charging voltage level provided to a second battery (Figure 3, Elements 11 and 12y).

Applicants' amended claim 1 is directed to a charging circuit for controlling a system charging parameter provided to a host of batteries by a DC to DC converter. Applicants have cancelled, without prejudice, claim 3 since some claim 3 limitations have been incorporated into claim 1.

Amended claim 1 requires "a third path configured to monitor a first battery charging voltage provided to said first battery" and "a fourth path configured to monitor a second battery charging voltage provided to said second battery." For example, Applicants' FIG. 7 details an embodiment of a third path that monitors the battery charging voltage provided to Battery A that may include the resistors 721, 722 to scale down the voltage at terminal 798 and an error amplifier 726 to compare the scaled down voltage with a maximum charging voltage level for Battery A. See page 28, line 16 to page 29, line 4 of Applicants' specification. Applicants' FIG. 7 also details an embodiment of a fourth path that monitors the battery charging voltage provided to Battery B that may include the resistors 719, 720 to scale down the voltage at terminal 799 and an error amplifier 725 to compare the scaled down voltage with a maximum charging voltage level for Battery B. See page 29, lines 4 – 14 of Applicants' specification.

In contrast, Kitagawa does not teach, disclose, or suggest such a "third path" and "fourth path" as required by amended claim 1. The element 11 of FIG. 3 of Kitagawa pointed out by the Examiner is a DC to DC converter and the elements 12x and 12y are switches in series with batteries x and y respectively. The DC to DC converter 11 accepts an input voltage from an external power source and provides a charging current to the battery(ies) 14x and 14y. The switches 12x and 12y when closed provide a path for charging or discharging current to flow to and from each battery and when open isolate the battery.

For instance, regarding the switches 12x and 12y of FIG. 3, Kitagawa first details a "principle configuration of the present invention" in FIG. 2 (column 4, lines 62 – 63) having switches 3 representing the switches 12x and 12y of FIG. 3. Kitagawa teaches:

> Switches 3 are inserted in series in each of the plurality of batteries 5. When one of the switches 3 is switched on, a current route is established, and a charging or discharging current flows through a corresponding battery 5 connected to the switch 3. Meanwhile, when the switch 3 is switched off, the current route is disconnected, and the charging or discharging current is stopped. Column 5, lines 14 – 20.

Regarding the DC – DC converter 11 of FIG. 3, Kitagawa teaches:

> The DC-DC converter for charging comprises a capacitor 20 for eliminating the ripple on a voltage supplied from a power source connected to an external power source terminal, for example, an AC adaptor through a diode 9, and a FET 21 switched on/off when two batteries 14x and 14y are to be charged to control charging current, and is always on when these batteries are discharged, a smoothing reactance 22, a smoothing capacitor 23, a fly-wheel diode 24, and a PWM control circuit 25 for controlling the on/off of the FET 21 when the batteries 14x and 14y are to be charged. Column 5, lines 37 – 46.

Applicants' amended claim 1 also requires that the "regulating circuit" is "configured to reduce said system charging parameter provided to said host of batteries by providing a control signal to said DC to DC converter." For example, in the embodiment of FIG. 7 the regulating circuit 716 provides a control signal to the switches SW5 and SW6 of the DC to DC converter 770. Amended claim 1 therefore further clarifies that the "third path" and "fourth path" are separate elements from the "DC to DC converter"

In addition, claim 1 also requires "said first and second maximum charging current levels and said first and second maximum charging voltage levels [are] provided to at least one input terminal of said charging circuit by a host power management unit." For example, Applicants' FIG. 7 details an embodiment where a power management unit 735 provides first and second

maximum charging current levels via the ISET terminal of the charging circuit 733 and the first and second maximum charging voltage signals via the VSET terminal of the charging circuit 733. Hence, the charging circuit may accept first and second maximum charging current levels and first and second maximum charging voltage levels that differ depending on various conditions including differing battery types and sizes. Thus, the charging circuit 733 is adaptable to many different multiple battery configurations.

In contrast to that required by claim 1, Tamai generally teaching to perform hysteresis charging (repetitive peak and trough charging) of a battery after constant current charging and before constant voltage charging. Column 2, lines 22 – 29. Constant current charging is performed until the battery voltage reaches a first prescribed voltage V1 which is slightly higher than a second prescribed voltage V2. Column 4, lines 40 – 44. See also FIG. 3 and 4 of Tamai. Hysteresis charging may then be performed after the constant current charging and in one instance the voltage may oscillate back and forth between V1 and V2. Column 4, lines 64 – 67 and FIG. 4. FIG. 9 of Tamai illustrates an embodiment having a constant voltage charging circuit 96 and a constant current charging circuit 97. The opamp 96A receives one of two reference voltage from reference voltage sources E1 and E2. "The reference voltage E1 of the constant voltage charging circuit 96 determines the first prescribed voltage V1 and the reference voltage E2 determines the second prescribed voltage V2." Column 8, lines 5 – 8. Similarly, the opamp 97A of the constant current charging circuit 97 has a "- input terminal [that] connects with a reference voltage source." Column 8, lines 11 – 12. Thus, each opamp 96A and 97A receives a fixed reference source particular to a known configuration and is therefore not readily adaptable to differing configurations.

In summary, neither Kitagawa nor Tamai, alone or in combination, teach a "a third path configured to monitor a first battery charging voltage provided to said first battery" and "a fourth path configured to monitor a second battery charging voltage provided to said second battery" as required by claim 1. Emphasis added. In addition, neither Kitagawa nor Tamai, alone or in combination, teach the "said first and second maximum charging current levels and said first and second maximum charging voltage levels provided to at least one input terminal of said charging circuit by a host power management unit" as also required by claim 1. Emphasis added.

Claim 3 has been cancelled without prejudice. Claims 2, 4, and 5 depend directly or indirectly from claim 1 and as such incorporate all the limitations of claim 1. Therefore, Applicants respectfully submit claims 2, 4, and 5 are also allowable by virtue of their dependency, directly or indirectly, from claim 1 in addition to their own further limitations.

In particular, amended claim 5 further requires "an output of said first and second error amplifiers [are] coupled directly to said regulating circuit." Emphasis added. No new matter has been entered and support for this amendment can be found throughout the specification including FIGs. 7 – 9, and page 30, lines 1 – 16 of Applicants' specification. For example, Applicants' FIG. 7 details error amplifiers 724 and 723 coupled directly to the regulating circuit 716.

In contrast to that required by claim 5, Tamai (FIG. 9) teaches the output of the opamp 96A of the constant voltage charging circuit 96 is coupled to a diode and then to the photocoupler 90 and finally to the PWM control circuit 89. Similarly, the opamp 97A of the constant current charging circuit 97 is coupled to another diode and then to the photocoupler 90 and finally to the PWM control circuit 89. With reference to the opamp 96A, Tamai teaches:

> The op-amp 96A of the constant voltage charging circuit 96 compares the voltage divided battery voltage at its + input terminal with a reference voltage connected with its

> - input terminal. When the battery voltage exceeds a prescribed voltage, the + input voltage of the op-amp 96A exceeds the - input reference voltage. When this occurs, the output of the op-amp 96A becomes +, current does not flow through the diode, and the LED (light emitting diode) of the photocoupler 90 does not emit light. Under these conditions, the PWM control circuit 89 controls transistor 86 of the switching section 85 to reduce power output to the battery. The reference voltage E1 of the constant voltage charging circuit 96 determines the first prescribed voltage V1 and the reference voltage E2 determines the second prescribed voltage V2. Emphasis added. Column 7, line 61 to column 8, line 8.

In summary, Applicants claim 5 requires "an output of said first and second error amplifiers [are] coupled directly to said regulating circuit" and the regulating circuit provides a "control signal to said DC to DC converter." In contrast, Tamai's opamps 96A and 97A are coupled directly to respective diodes and then are coupled to the photocoupler 90. The photocoupler 90 is then coupled to the PWM control circuit 89 that provides a control signal to the switching transistor 86.

Claim 6 is an independent claim that requires "monitoring a first battery charging voltage provided to said first battery with a charging circuit; monitoring a second battery charging voltage provided to said second battery with a charging circuit; and reducing said system charging parameter provided to said host of batteries if said first charging current level exceeds a first maximum charging current level or said second charging current level exceeds a second maximum charging current level, or said first battery charging voltage exceeds a first maximum charging voltage level, or said second battery charging voltage exceeds a second maximum charging voltage level, said first and second maximum charging current levels and said first and second maximum charging voltage levels provided to at least one input terminal of said charging circuit by a host power management unit." Emphasis added. For similar reasons adduced above regarding independent claim 1, Applicants respectfully submit claim 6 is also allowable.

Claim 8 has been cancelled without prejudice. Claims 7 and 9 depend directly or indirectly from claim 6 and as such incorporate all the limitations of claim 6. Therefore, Applicants respectfully submit claims 7 and 9 are also allowable by virtue of their dependency, directly or indirectly, from claim 6 in addition to their own further limitations.

Claim 10 is an independent claim requiring "a third path configured to monitor a first battery charging voltage provided to said first battery; a fourth path configured to monitor a second battery charging voltage provided to said second battery; and a regulating circuit configured to reduce said output parameter of said DC to DC converter if one of said first battery charging current, said second battery charging current, said first battery charging voltage, and said second battery charging voltage exceeds an associated maximum level when said first battery and said second battery are coupled in parallel, said associated maximum levels provided to at least one input terminal of said charging circuit by a host power management unit." Emphasis added. For similar reasons adduced above regarding independent claim 1, Applicants respectfully submit claim 10 is also allowable.

Claim 11 is an independent claim requiring "a power management unit configured to provide an output signal representative of at least a first maximum charging current level, a second maximum charging current level, a first maximum charging voltage level, and a second maximum charging voltage level" and "a third path configured to monitor a first battery charging voltage provided to said first battery and compare said first battery charging voltage to said first maximum charging voltage level" and "a fourth path configured to monitor a second battery charging voltage provided to said second battery and compare said second battery charging voltage to said second maximum charging voltage level" and "said first and second maximum

charging current levels and said first and second maximum charging voltage levels provided to at least one input terminal of said charging circuit by said power management unit." Emphasis added. For similar reasons adduced above regarding independent claim 1, Applicants respectfully submit claim 10 is also allowable. In addition, Tamai does not teach "a power management unit configured to provide an output signal representative of at least a first maximum charging current level, a second maximum charging current level, a first maximum charging voltage level, and a second maximum charging voltage level" as required by claim 1.

Claims 12 - 15 depend directly or indirectly from claim 11 and as such incorporate all the limitations of claim 11. Therefore, Applicants respectfully submit claims 12 - 15 are also allowable by virtue of their dependency, directly or indirectly, from claim 11 in addition to their own further limitations. Regarding claim 15, Hatular (US Pat. No. 6,184,660) does not provide the missing teachings of Kitagawa and Tamai as earlier detailed.

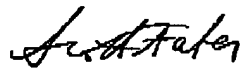
Claim 16 is an independent claim requiring "a power management unit (PMU) configured to run a power management routine" a charging circuit comprising "a third path configured to monitor a first battery charging voltage provided to said first battery and compare said first battery charging voltage to said first maximum charging voltage level; a fourth path configured to monitor a second battery charging voltage provided to said second battery and compare said second battery charging voltage to said second maximum charging voltage level" and "said first and second maximum charging current levels and said first and second maximum charging voltage levels provided to at least one input terminal of said charging circuit by said power management unit." For similar reasons adduced above regarding independent claim 1, Applicants respectfully submit claim 16 is also allowable. In addition, Yilmaz et al (US. Pat.

No. 5,715,156) does not provide the missing teachings of Kitagawa and Tamai as earlier detailed.

Claim 17 depends directly from claim 16 and as such incorporates all the limitations of claim 16. Therefore, Applicants respectfully submit claim 17 is also allowable by virtue of its dependency from claim 16 in addition to its own further limitations.

Applicants respectfully submit that in light of the foregoing claim amendments and remarks, all of the presently pending claims are now in a condition for allowance. Reexamination and reconsideration are respectfully requested. Early allowance is earnestly solicited. In the event the Examiner deems personal contact desirable in disposition of this application, the Examiner is respectfully requested to call the undersigned attorney at (603) 668-6560. In the event any additional fees are payable, please charge them to our Deposit Account No. 50-2121.

Respectfully submitted,



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